REVIEW OF A STRATEGIC ENVIRONMENTAL ASSESSMENT FOR THE SOUTHWESTERN SCOTIAN SLOPE

Context

In October, 2011, the Ecosystem Management Branch in the Maritimes Region requested that DFO Maritimes Science undertake a review of a Canada-Nova Scotia Offshore Petroleum Board (CNSOPB) document entitled "Strategic Environmental Assessment: Petroleum Exploration Activities on the Southwestern Scotian Slope" (Hurley 2011). Ecosystem Management requested DFO Science advice on the report related to the following question:

i) Does the CNSOPB Strategic Environmental Assessment (SEA) of the southwestern Scotian Slope adequately outline ecosystem attributes and potential ecosystem-offshore petroleum interactions in context of what is known of the marine ecosystem of the southwestern Scotian Slope?

This information would be provided to the CNSOPB and may be used to refine future Environmental Effects Monitoring (EEM) programs and/or adjust mitigation measures to ensure environmental protection objectives are met. It was requested that a response be provided by November, 2011. Given the short timeframe for review, DFO's Science Special Response Process was used.

In the review, it was found that the SEA had generally identified the major ecosystem attributes of the southwestern Scotian Slope study area (and applicable surrounding areas), as well as completed an assessment that provided a general characterization of applicable environment-offshore petroleum activity interactions. However, several aspects of the SEA were felt to require further attention.

Background

On June 30, 2011, the CNSOPB announced a Call for Bids for eight offshore, deepwater petroleum parcels located on the southwestern Scotian Slope in the offshore of Nova Scotia, which closes on January 10, 2012. In advance of the closing date, the CNSOPB released a draft SEA of the proposed parcels with the intent to identify potential environment-petroleum exploration activities that may exist and need to be considered in regard to future offshore petroleum exploration and development activities in the area.

Response

The SEA has generally identified the major ecosystem attributes of the southwestern Scotian Slope study area, as well as completed an assessment that provides a general characterization of applicable environment-offshore petroleum activities. However, there are a number of aspects, including impacts of seismic noise, applicability of shallow water platform and potential risk of natural events on offshore activities, that could be enhanced through further clarification and attention.

Introduction

To help locate the study area, it is recommended that bathymetric contours be added to the insert map (Hurley 2011, Figure 1). Further, it is recommended that appropriate citation procedures be applied throughout the report, particularly in regard to figures and photos.

Exploration Activities

Section 2.3.2: Exploration Activities (Seismic Surveying)

The report indicates that 2-D seismic surveys are typically conducted with a small air gun and a streamer towed 2-4 m below surface in contrast to a larger air gun array and 4-6 m streamer tow depth typically associated with a 3-D survey. The shallower 2-D survey streamer tow depth and smaller source array suggest a higher operational frequency range and a consequent shallower sub-bottom penetration for the 2-D Survey. Further, on Page 2.7 in Table 1 (Hurley 2011), large–scale approximately 3,000–6,000 cu. in. air guns are associated with both 2-D and 3-D exploration seismic surveys. Davis el al. (1998) state, "the source levels for 2D arrays are often slightly higher than those used in 3D surveys" (p 14). Clarification regarding the practice of smaller arrays for 2-D surveys is required as the 2-D seismic survey may have been mistaken for the 2-D high resolution seabed survey treated immediately below, and described as using the same shallow 2-4 m single streamer tow depth.

Seismic survey areas can cover hundreds (for 3-D surveys) to thousands (for 2-D surveys) of squared-kilometres in area. Therefore, given the number of proposed lease sites and large size of the Call for Bids area, further information regarding anticipated exposure time of the marine ecosystem to seismic sound is recommended.

Information concerning the consideration of emerging alternative survey methods under developments that may avoid the use of air guns is suggested.

The duration of seismic surveys is described as "typically less than a month" (p.2.4). In the past seismic programs on several blocks in the offshore of Nova Scotia have run longer than 3 months. Additional information concerning timelines is suggested.

Section 2.3.2: Exploration Activities (Deepwater Drilling)

Clarification that the drill ship is maintained accurately on station using a satellite geo-reference system rather than a "relatively constant position" is required.

Section 2.3.3: Management of Routine Discharges/Emissions and Solid Waste

In many instances, the listed mitigation measures only state that standards will be met; however, no information of details regarding specific waste minimization measures are provided. According to the Offshore Waste Treatment Guidelines (National Energy Board et al. 2010), "offshore operators are expected to take all reasonable measures to minimize the volumes of waste materials generated by their operations, and to minimize the quantity of substances of potential environmental concern contained within these waste materials" (p.4). As such, deck draining (currently not mentioned), should be identified and follow the same 15 mg L^{-1} concentration oil rule. In addition, discharges associated with installation and maintenance of subsea systems should also be identified. Last, consideration should be given to the additional operational malfunctions that may occur during routine emissions which include

drill waste, exhaust fumes and hydrocarbon spills from equipment, as well as there associated mitigation measures (Table 1).

Table 1. Examples of additional operational malfunctions that may occur during routine emissions.

Sources	Characteristics	Mitigation
Exhaust fumes from generators, engine and utilities on offshore vessels/drilling rig. There is a potential risk of hydrocarbon spills from motorized equipment.	These devices can generate potential spills and emissions (incomplete combustion) of hydrocarbons.	Required mitigation of hydrocarbon spills (petroleum products such as gasoline, diesel, etc.) in compliance with the Nova Scotia *Environment Act* is required. Spills are mentioned in Section 2.3.4 Management of Accidental Release (this highlights response plans). Hydrocarbon emissions may be minimal if low emission certified equipment is used.
Drill Waste	In addition to the water-based, synthetic-based, and enhanced mineral oil-based muds – specific reference should also be made to process chemicals	Note regulatory acceptance of use and recommended mitigation procedures in accordance with government regulations. Identify potential treatment technologies prior to disposal of spent and excess synthetic-based muds or enhanced mineral oil-based muds and their cuttings.

The report indicates, "Noise generated by various technologies used for surveying the seabed is of low pressure (below the CEAA EA threshold pressures of 275.79 kPa at a distance of one metre from the seismic source (*i.e.*, 229 dB re 1 µPa@1m) and of high frequencies which attenuate over a short time (milliseconds) and distance (metres)" (p.2.7). While the main interest may be the top few metres or tens of metres of the bottom, it should be noted that sound radiated by even a small airgun array in the off-vertical direction can travel a long distance in the water column.

It is suggested that reference to "180 dB re 1 µPa @ 1 m" as a threshold for potential adverse effects on marine mammals (e.g., on p.2.7 of Hurley 2011) should be changed to "180 dB re 1 µPa",, since the former is a sound source level measured at a reference distance of 1 m from the source while the latter is a sound pressure level at a specific point in the water column.

Additional measured sound levels from drilling/production activities should be cited, since the Venture platform is representative of a shallow water setting, while most areas of the Southwestern Scotian Slope constitute a deep-water environment where different production technologies would be employed.

Section 2.3.4: Management of Accidental Releases

It is recommended that the phrase "extreme weather scenarios" (p.2.9) be defined.

In addition to adjusting process equipment and operating practices, system redundancy should also be cited as a preventative step in avoiding spills, leaks and discharges.

Area Information

Section 2.4.2: Ocean Use

It is unclear if the author is referring to 2-D/3-D seismic activity as opposed to 2-D/2-D seismic activity in the following sentence: There has been much 2-D/2-D seismic activity on the Scotian Shelf and Slope areas over the past 40-50 years.

The discussion of the petroleum industry should include a reference to pipelines, even though there may be none in this area.

Environmental Assessment Scoping

Section 3.4: Selection of Valued Ecosystem Components (Species at Risk)

The statement that, "SAR by definition are more sensitive" (p.3.3) should be clarified since a species at risk may be placed on Schedule 1 pursuant to the *Species at Risk Act* for reasons other than sensitivity.

Section 3.4: Selection of Valued Ecosystem Components (Noise)

It is noted that the northern boundaries of some of the NS11-1 parcels reach and overlap with areas of high historical commercial groundfish catches (p.4.20, Fig. 7) and large pelagic catches (p.4.21, Fig. 8) along the Scotian Shelf break. It is recommended that the potential effects of noise radiated from exploratory seismic activities that may impact the movement and short- and long-term catchability of commercial fish species, including both groundfish and large pelagics be included within this report. Such effects are noted at several points throughout the SEA, but are not well documented in any one section of the assessment.

The statement, "Few, if any effects of noise, are predicted for large pelagic fish species such as swordfish, sharks and tunas or invertebrate species such as lobsters, crabs, or scallops or corals which do not contain sound sensitive organs such as air bladders like those found in some fish species and reside on the sea floor far from the seismic sound source on the sea surface" (p.3.7, Table 4) is considered inaccurate. First, tunas are teleost fishes that contain swim bladders. Secondly, there have been no studies on seismic effects on sharks; however, sharks are known to have very acute hearing for low frequency sounds, which they use to locate prey (Dr. Stephen Campana, pers. comm., DFO Science). Therefore, it is possible that seismic surveys may have behavioural (not lethal) effects on any pelagic sharks in the area. The effect of seismic on shark hearing requires further consideration.

Section 3.4: Selection of Valued Ecosystem Components (Accidental Oil Spills)

The relationships between valued ecosystem components and potential impacts is unclear. Further consideration of wording and terminology are suggested.

Section 3.7: Data Gaps and Uncertainties

In addition to the recognition of data gaps, information highlighting how they can be resolved should be included. For example, the detection of marine mammals in low light or fog conditions could be further discussed based on the results of past programs of study. Passive Acoustic Monitoring as a mitigation measure is discussed later in the report (p. 7.5), although it

is not clear if this is intended to be used as noted in the 'Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment.'

Effects on Species at Risk

Section 4.2.1: Sowerby's Whale, Blue Whale and Sea Turtle SAR: Sowerby's Beaked Whale

The statement concerning Leatherback turtle abundance should be updated to include North Atlantic abundance estimates. The report indicates, "34,500 nesting females in Pacific (1995); Atlantic population more stable; no estimate for Canadian waters" (p.4.4); however, the Turtle Expert Working Group (2007) estimated abundance at 34,000 to 94,000 adults in the North Atlantic.

Within Table 5 (Hurley 2011), the statement, "Risk of spill from a seismic streamer break can be eliminated with the use of solid streamer" should be clarified as it is unclear if solid streamers are typically used.

Section 4.2.2: Cusk, Bluefin Tuna, Blue Shark, Porbeagle Shark

Within the description of cusk, the report states, "Identified by a combination of single pollock and single dorsal fin" (p.4.7). While it is unclear what structure "a single pollock" is referring to, cusk are the only gadid with a single barbell and single dorsal fin.

The statement, "Fishing is an important source of mortality. Despite a directed fishery, cusk is mainly caught as bycatch in cod, haddock, and pollock and halibut longlines" (p.4.7) is inaccurate. While there is no official directed fishery for cusk, the species is managed as a bycatch only, with a Total Allowable Catch cap.

Cusk's status as threatened under the *Species at Risk Act* is incorrect. Cusk are considered threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

The section regarding the habitat and distribution of porbeagle shark should be updated to include information pertaining to the population off Europe in the Northeast Atlantic. Further, while porbeagle shark are typically found nears continental shelves, they are found in greatest numbers near the shelf edge.

Porbeagle shark are known to concentrate in the SEA study area (Figure 1) from February-June. There may need to be further consideration regarding the allowance of seismic surveys in context of porbeagle concentrations during this period. Please refer to Campana et al. 1999 for additional information regarding porbeagle distribution.

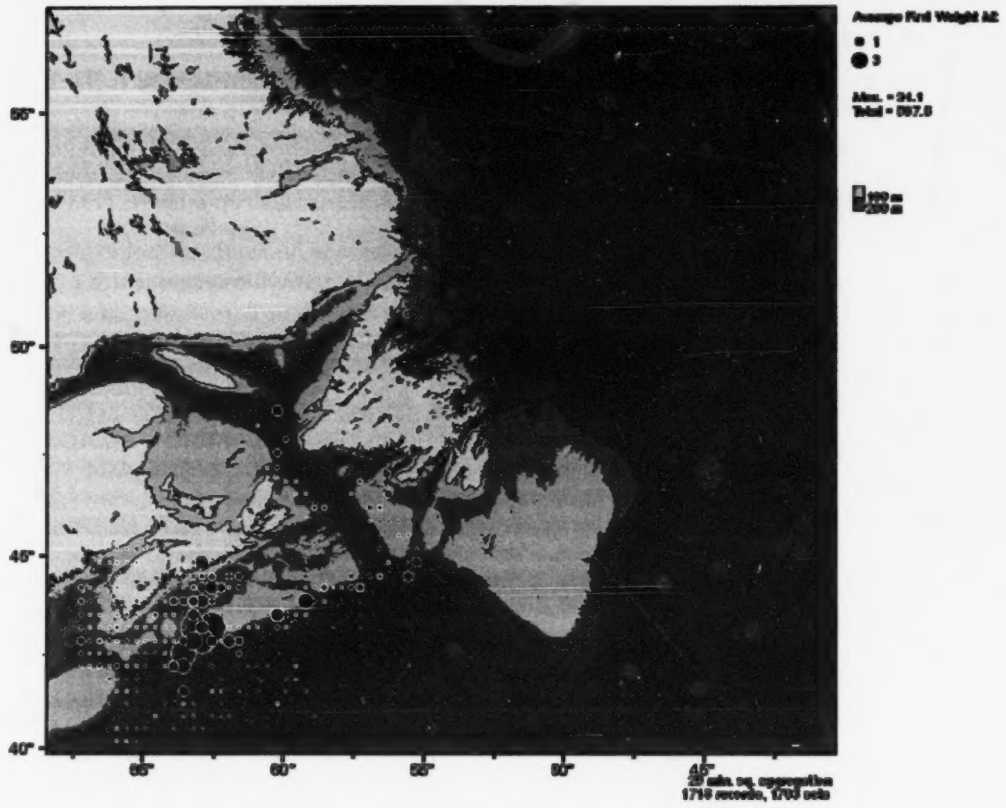

Figure 1. Porbeagle catch locations from 2005-2008.

Effects on Commercial Fish and Fisheries

Section 4.3.1: Swordfish, offshore lobster and sea scallop

Within the report, several errors were identified concerning the summary of sea scallop (*Placopecten magellanicus*):

The report indicates the species of scallop pictured is *Placopecten magellanicus*. It is not.

The statement, "Distinctive fan-shaped shell with radiating ribs and concentric growth rings" (p.4.13) is considered incorrect as radiating ribs are not evident in *P. magellanicus*.

The statement, "North of Cape Cod - found at depths less than 20 m, south of Cape Cod - found at 40-200 m deep" (p.4.13) is considered incorrect as scallops in the northern part of their range are found at depths of 10-120 m.

The offshore fishery is managed under an Enterprise Allocations and not an Individual Transferable Quota (ITQ) system as indicated within the report.

The description of the "The New Bedford" rake is considered incorrect. The rake is described as having spikes to which a chain-mesh bag in attached; however, the rake does not contain

spikes. Rather, the ring mesh is attached with shackles along the pressure plate of the bridle. In regard to the size of warp, freezer trawlers use 1¼ inch, while some of the fresh boats used 1 1/8 inch.

Effects of the Environment on Exploration Activities

Section 5.4: Seismicity and Tsunamis

It is suggested that risk significance and/or mitigation be included within this subsection as this would provide an indication as to the potential impact of a seismic event on the range of possible offshore petroleum projects. Furthermore, the term "unknown" is an awkward descriptor for the likelihood of an earthquake.

Section 5.5: Sediment Transport and Seabed Stability

Information on the potential risk, as a result of sediment type and stability, to the range of possible offshore petroleum projects should be included within this subsection.

Summary and Conclusions

On page 7.7, the reports directs readers to Table 5, Interaction #5 to review mitigation measures that reduce the likelihood of significant adverse effects of seismic noise on sea turtles (i.e., Leatherback turtle); however, there is no "Interaction #5 in this table. Likely, this is meant to refer to Interaction #2.

Conclusions

The strategic environmental assessment has generally identified the major ecosystem attributes of the southwestern Scotian Slope study area (and applicable surrounding areas), as well as completed an assessment that provides a general characterization of applicable environment-offshore petroleum activity interactions. However, aspects of the SEA require further attention, including: 1) clarification of the duration and scale of potential 2-D and 3-D seismic programs that may be anticipated; 2) clarification of potential impacts of seismic noise on sharks (e.g. timing in relation to porbeagle shark concentrations in the study area); 3) further discussion regarding potential interactions between seismic sound and the movement and catchability of commercial (and other) fish species; 4) applicability of a shallow water platform used to characterize drilling noise at this deep water site; and 5) greater consideration of the potential risks to offshore petroleum activities due to natural events (e.g. earthquakes and sediment instability), including proposed mitigation measures to address such risks. The addition of these aspects would enhance the quality of the environment assessment.

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Sources of Information

Campana, S., L. Marks, W. Joyce, P. Hurley, M. Showell, and D. Kulka. 1999. An Analytical Assessment of the Porbeagle Shark (*Lamna nasus*) Population in the Northwest Atlantic. DFO Can. Sci. Advis. Sec. Res. Doc. 1999/158.

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Turtle Expert Working Group, 2007. An Assessment of the Leatherback Turtle Population in the Atlantic Ocean. NOAA Technical Memorandum NMFS-SEFSC-555, 116 p.

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